METROPOLITAN WASHINGTON | COUNCIL OF GOVERNMENTS

Local governments working together for a better metropolitan region

MEMORANDUM

District of Columbia
Bowie
College Park
Frederick County
Gaithersburg
Greenbelt
Montgomery County
Prince George's County
Rockville
Takoma Park
Alexandria
Arlington County
Fairfax
Fairfax County
Falls Church
Loudoun County
Manassas
Prince William County

January 9, 2004

To: TPB Technical Committee

From: Daivamani Sivasailam
              Principal Transportation Engineer

Subject: Research Tasks to Develop Refined Inputs to Mobile 6 Model

I. Introduction

When EPA released the Mobile6 model, a task force made up of TPB Technical Committee members and the MWAQC Technical Committee members (Mobile6 Task Force) met over a period of time to discuss the input data for the Mobile6 model. Attachment A is a memorandum from Ronald F. Kirby dated November 6, 2002 to the task force discussing the recommendations on the future updates to the input data to Mobile6. The recommendations from the memorandum are incorporated as the following research tasks.

a) Explore the possibilities: (1) of obtaining vehicle registration data in categories more closely aligned to the vehicle categories used in Mobile6 and (2) of using a 'dynamic registration' utility to address changes in vehicle age distributions and diesel fractions through time.

b) Explore the possibilities: (1) of obtaining odometer data, along with vehicle identifier code and gross vehicle weight data, from the air management agencies in order to develop refined VMT data by vehicle weight class for the Washington region, and (2) of obtaining additional classification counts that can be used to update the regional truck model.

This memorandum outlines a draft research approach to address each of these tasks:

1) To obtain vehicle registration (vehicle classification corresponding to Mobile6, and vehicle age by jurisdiction)
2) Review feasibility of dynamic registration utility to address changes to vehicle classification percentages over time
3) To collect VMT data by vehicle type from air management agencies, and
4) To enhance current classification count program and the regional truck model.

II. Mobile5b vs. Mobile6 Model vehicle Characteristics

The Mobile5b model required input on VMT by eight vehicle classes. The Mobile6 model requires VMT input by 16 classes, along with diesel sales fractions. Mobile6 then divides the 16 weight classes by fuel type, i.e., gas, diesel, to give VMT by 28 vehicle classes. These 28 vehicle categories are shown in table 1. Mobile5b model had 8 vehicle types and they are: LDGV, LDGT1, LDGT2, HDGV, LDDV, LDDT, HDDV, and MC. The United States Department of Transportation (USDOT) collects and reports VMT data in the Highway Performance Monitoring System (HPMS) based on the FHWA vehicle classification system. The FHWA vehicle class versus Mobile6 vehicle class is shown in Table2.

Table   Mobile 6 Vehicle Classifications

	Abbreviation	Description
1	LDGV	Light-Duty Gasoline Vehicles (Passenger Cars)
2	LDGT1	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
3	LDGT2	Light-Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
4	LDGT3	Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)
5	LDGT4	Light-Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. greater ALVW)
6	HDGV2b	Class 2b Heavy-Duty Gasoline Vehicles (8,501-10,000 lbs. GVWR)
7	HDGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs. GVWR)
8	HDGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs. GVWR)
9	HDGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)
10	HDGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs. GVWR)
11	HDGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs. GVWR)
12	HDGV8a	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs. GVWR)
13	HDGV8b	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs. GVWR)
14	LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
15	LDDT 1, 2	Light-Duty Diesel Trucks 1 and 2 (0-6,000 lbs. GVWR)
16	HDDV2b	Class 2b Heavy-Duty Diesel Vehicles (8,501-10,000 lbs. GVWR)
17	HDDV3	Class 3 Heavy-Duty Diesel Vehicles (10,001-14,000 lbs. GVWR)
18	HDDV4	Class 4 Heavy-Duty Diesel Vehicles (14,001-16,000 lbs. GVWR)
19	HDDV5	Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs. GVWR)
20	HDDV6	Class 6 Heavy-Duty Diesel Vehicles (19,501-26,000 lbs. GVWR)
21	HDDV7	Class 7 Heavy-Duty Diesel Vehicles (26,001-33,000 lbs. GVWR)
22	HDDV8a	Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs. GVWR)
23	HDDV8b	Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs. GVWR)
24	MC	Motorcycles (Gasoline)
25	HDGB	Gasoline Buses (School, Transit and Urban)
26	HDDBT	Diesel Transit and Urban Buses
28		Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs. GVWR)

Table 2: Vehicle classification under FHWA and Mobile6

FHWA	MOBILE 6
Passenger Cars	LDGV
	LDDV
MC	MC
Buses	HDGBS, HDGBT
	HDDBS, HDDBT
OTHER 2 AXLE 4 Tire	LDGT
	LDGT 2,3,4
	LDDT 1,2,3,4
OTHER 2 AXLE 6 Tire	HDGV 2b,3,4,5
	HDDV 2b,3,4,5
Comb Truck and Trailer	HDDV 5,6,7; HDGV 5,6,7
Comb Truck and Multi Trailer	HDDV 8a,8b; HDGV 8a,8b

III. Research Tasks

Vehicle registration: Currently the state air management agencies work with their respective department of motor vehicles and obtain vehicle registration data by jurisdiction for 5 vehicle categories and also diesel sales fraction. Staff will discuss with the air management agencies approaches to get data closer to the 16 Mobile6 vehicle categories by investigating the vehicle categories listed in the DMV files and tabulating them in to the Mobile6 categories and the diesel sales fractions.

2. Dynamic registration utility: Mobile5b model had an operational dynamic registration utility which aged base year vehicle registration data over time. Staff will discuss the status of the utility with EPA and if the utility is available for use test it using local data and review changes to vehicle registration over time.

3. VMT by vehicle class: Currently the VMT for the different vehicle classes are obtained through a process involving Mobile6 defaults modified with heavy duty truck percentages from the regional truck model. Staff will discuss with the air management agencies the feasibility of obtaining odometer data that is collected as part of the vehicle inspection and maintenance (I/M) program. This will involve discussing the vehicle categories for which odometer data is collected, the frequency of the data collection and how easily the data are accessible.

4. Truck data: Currently the VMT for school bus and transit bus are obtained from the operators, and the VMT for heavy duty truck are developed from the regional truck model. As part of this task, staff would research the existing truck counting program in each state and the region, and review the regional truck model including inputs, outputs, validation and forecasted changes over time. Currently the classification counts conducted for HPMS is based on the FHWA vehicle

classification system. Staff will review classification counts undertaken by the various jurisdictions and propose changes to the counting program to align the classification data to the Mobile6 vehicle classification system. Staff will also review COG truck surveys including origin, destination data for enhancing the heavy duty VMT data. Based on the above, staff will review truck data needs for light duty and heavy duty, and develop an approach and cost estimates for acquiring the truck data needed.

IV. Recommendations

At the conclusion of the above research activities, staff will review the findings and develop recommendations in each area, namely, vehicle registration data, dynamic registration, VMT data and truck data. Any data that are collected will be used for the cycle in July 1, 2005 as outlined in Ronald F. Kirby's memorandum.

Attachment A

NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD
METROPOLITAN WASINGTON COUNCIL OF GOVERNMENTS
777 North Capitol Street, NE
Washington, D.C. 20002-4239
Phone: (202) 962-3200   Fax: (202) 962-3202

MEMORANDUM

Date: November 6, 2002

To: Mobile 6 Task Force

From: Ronald F. Kirby
            Director, Department of
            Transportation Planning

Re: Future Updates to Methods and Data for
            Estimating Emissions From Mobile Sources

The Mobile 6 Task Force has held a number of meetings over the past ten months devoted to identifying the best methods and data currently available for the initial implementation cycle of the Mobile 6 emissions model released by EPA in January of 2002. Over this period the Task Force has been able to identify and agree upon a number of significant updates to methods and data inputs relative to those employed in the emissions analysis for the July 31, 2002 TPB conformity determination for the 2002 CLRP and FY03-08 TIP.

In the course of the Task Force deliberations, a number of recommendations were made concerning the timing and nature of future updates to methods and data. The purpose of this memorandum is to summarize and seek overall consensus on these recommendations. The four critical aspects of the process for estimating mobile source emissions are discussed in turn:

- Schedules
- Travel forecasts
- Vehicle registration data
  Vehicle miles of travel by vehicle class

I.   Schedules

At the VMT Work Group session held on August 19, 2002, there appeared to be consensus on the following points:

- Updates to methods and data should be carried out on a regular three-year cycle to correspond to the Periodic Emissions Inventory (PEI) requirement for air quality planning and the constrained long-range plan (CLRP) update requirement for transportation planning.

- To date, registration data have been updated to correspond to a July 1 date in 1996, 1999 and 2002. The next set of data should be collected for July 1, 2005, followed by 2008, and so on. Updates needed to other inputs to the mobile emissions model and to travel forecasting procedures should also be made on this same 3-year schedule.

- This three-year cycle will permit new emissions estimates to be developed by the Fall of the years in which new data are collected. If necessary, new mobile emissions budgets could then be established by the Spring of the following year, in advance of the adoption of the triennial CLRP update (scheduled for the Fall of 2003, 2006, 2009, and so on).

II.   Travel Forecasts

Travel forecasts for the Mobile 6 update are being developed using the TPB's Version 2.1 travel forecasting model, which provides significant improvements over the Version 1 model used previously. This Version 2.1 model has been developed and refined over the past three years, with regular presentations and review by the Travel Forecasting Subcommittee of the TPB Technical Committee. Future activities include:

- Careful review and refinement of the results of the Version 2.1 model by TPB staff and the Travel Forecasting Subcommittee.

- A peer review of the TPB travel modeling process to be conducted by the Transportation Research Board (TRB) of the National Academies over calendar year 2003, with an initial report by June 30, 2003 and a final report by December 31, 2003.

- Continued updates and refinements to the Version 2.1 model (possibly resulting in Version 2.2, 2.3 etc. as appropriate), in response to the recommendations of the TRB peer review, continuing work by TPB staff, continuing review by the Travel Forecasting Subcommittee, and continuing consultation with other practitioners using the model throughout the Washington region.

- Delineation of an updated version of the travel forecasting model in the Spring of 2005 for use in updating emissions estimates for the PEI in the Fall of 2005 and for the CLRP update in the Fall of 2006.

III.   Vehicle Registration Data

Vehicle registration data provide inputs to the mobile emissions model on numbers of vehicles, age distributions, and diesel fractions by vehicle class. The 1999 update to the vehicle registration data used newly available data from vehicle emissions and maintenance programs to quantify a significant ongoing shift in the vehicle fleet from passenger cars to sport utility vehicles (SUVs) and trucks, which had not been reflected in the previous 1996 data. This result led to a review of the vehicle miles of travel (VMT) data, and a similar shift in these data toward a heavier vehicle mix. The resulting increases in mobile emissions created conformity problems which the TPB had to resolve within mobile emissions budgets which had been established using earlier registration and VMT data. In effect, adjustments had to be made to the transportation plan and program to offset emissions increases resulting from the shift to heavier vehicles in the vehicle fleet.

Since the 2002 registration data are being introduced along with updates to other data and methods, including the introduction of Mobile 6, as part of a SIP update to meet criteria for a severe non-attainment area, there will be an opportunity to revise mobile emissions budgets to reflect these new data and methods. The proposed regular three-year update cycle described in section I above would ensure that similar opportunities to revise mobile emissions budgets in the SIP are provided each time updates to methods and data for emissions estimation are undertaken in the future.

The July 1, 2002 registration data for the District of Columbia, Maryland, and Virginia provide a "snapshot" of numbers of vehicles, age distributions, and diesel fractions for five categories of vehicles as defined in the Mobile 5b model:

- light duty vehicles (passenger cars)
- light duty truck 1 (0 to 6,000 lbs GVWR)
- light duty truck 2 (6,001 to 8,500 lbs GVWR)
- heavy duty vehicles (over 8,500 lbs GVWR)
- motorcycles

Mobile 6 default values are being used to subdivide these five categories to provide values for each of the 28 vehicle classes defined in Mobile 6. Age distributions (percentages of vehicles by age) and diesel fractions are being held constant at the 2002 values for all future years.

Future update activities with regard to vehicle registration should include

- Exploring the possibility of obtaining vehicle registration data by more of the vehicle categories used in Mobile 6, rather than relying on default values to subdivide the Mobile 5 categories listed above;

- Exploring the possibility of using a "dynamic registration" utility to "age" the existing fleet over time, scrap old vehicles, and introduce new vehicles into the fleet, rather than holding age distributions and diesel fractions constant for all future years.

IV   Vehicle Miles of Travel by Vehicle Class

Mobile 5b required inputs on VMT by the eight vehicle classes. Mobile 6 requires VMT inputs by the 16 vehicle weight classes, along with diesel sales fractions. Mobile 6 then divides the 16 weight classes by fuel types to give 28 vehicle classes. The main source of data on VMT by vehicle weight class is that collected annually by the states for the Federal Highway Administration (FHWA) under the Highway Performance Monitoring System (HPMS). These data have severe limitations in their applicability to emissions modeling, in that samples are designed to provide statewide estimates, and the data collection methodology cannot provide the fine distinctions between vehicle classes required by EPA's Mobile models.

As with vehicle registration data, a blend of local data and Mobile 6 default values is being used to provide VMT input by the 16 vehicle weight classes required by Mobile 6. After an extensive review of local data availability and alternative methodologies for providing these VMT inputs to Mobile 6, the following data and methodologies have been identified as the "best available" for the initial implementation cycle of Mobile 6.

VMT and fleet composition for the transit bus and school bus categories are being developed from data obtained from fleet managers throughout the region, and provided as direct input to Mobile 6. These VMT percentages will be adjusted through time based on the Mobile 6 defaults.

An aggregate VMT percentage for the eight heavy duty vehicle categories is being obtained from the truck components of the TPB travel model. The Mobile 6 default values will then be used to distribute this aggregate VMT percentage over the eight heavy duty vehicle types over time. (EPA Mobile 6 implementation guidance indicates that the HPMS truck categories

addressed in the TPB truck model correspond to the heavy duty vehicle categories defined by EPA in constructing the Mobile 6 model.)

An aggregate VMT percentage for the six light duty categories (light duty vehicles, the four classes of light duty trucks, and motorcycles) will be obtained from the remaining components of the TPB travel model, including all personal travel and light goods movement. The Mobile 6 default values will be used to distribute this aggregate VMT percentage over the six light duty vehicle types over time. Reliance on the Mobile 6 defaults is necessary since there are currently no local VMT data which provide the fine-grained divisions across these six vehicle classes.

- VMT on local roads which are not included in the TPB travel modeling process will be developed "off-line" as in the past. Data collected in the local road survey conducted by TPB staff in early 2002 will be used to provide the aggregate VMT totals for the six heavy duty vehicle categories and the six light duty categories described above. These VMT percentages will be adjusted through time based on the local survey data and the TPB truck model. (Transit and school buses will be subtracted from the local VMT survey results since those VMT will be estimated separately, as described above).

Use of the above procedures to "blend" local data and travel forecasts with Mobile 6 defaults has some limitations which need to be addressed in future data development efforts:

- A recent report of March 2002 by Oak Ridge National Laboratory on class 2b trucks (vehicles of 8,500 to 10,000 lbs GVWR) notes that "although the class 2b truck is traditionally considered a commercial-size vehicle, many personal-use buyers have moved to these pickups, attracted by the "comfort" features as well as by the towing and hauling functionality. "However, the report notes further that: "Data on class 2b trucks are scarce. – At the moment, distinguishing class 2b trucks from class 2 trucks in general is a substantial task requiring data on an individual model level." The portion of personal travel in class 2b trucks will remain uncertain until additional data become available on the number and use of these vehicles.

Use of the national Mobile 6 default values to distribute aggregate VMT within the light duty and heavy duty categories may well result in a "heavier" VMT mix than actually exists in the Washington region, as local registration data indicate a lighter fleet composition than the national data. In the absence of local VMT data by the different light duty and heavy duty

Mobile 6 weight categories, however, use of the Mobile 6 defaults is currently the "best available" option.

In order to address these limitations for the next three-year update of these data inputs, two additional data collection activities are recommended:

- Requesting that odometer data be recorded as part of the I&M inspection along with the vehicle identification code and GVWR data currently collected, to provide local VMT data by vehicle weight class; and

- Exploring the possibility of designing and collecting additional counts by vehicle type and road functional class for the Washington region, as well as origin/destination data, that can be used to update the TPB truck model used for estimating VMT for the eight heavy duty vehicle classes.

If there is general consensus on the above recommendations concerning the next (2005) update cycle for methods and data for estimating emissions from mobile sources, consideration should be given to what actions need to be taken to implement these recommendations, by whom, and on what time frame.